Dose and Dose rate instruments

Lesson topic 5.3

Enabling Objectives

1. Perform gross and detailed radiological survey procedures, marking and recording those areas simulating radiological contamination
2. Describe shipboard radiological countermeasure procedures, to include radiation surveys and ship and personnel decontamination procedures
3. Measure the intensity or dose received from a radiation sources using one of the dose/dose rate instruments: DT-60, CP-95, AN/PDR 43 & 27, pocket dosimeter IM-143

Enabling Objectives

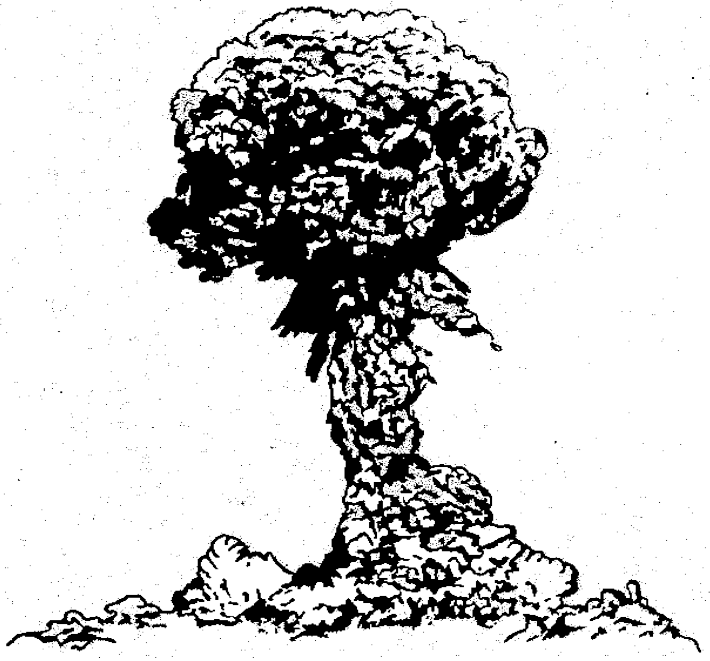
- Perform operator check procedures for the following instruments: AN/PDR 43 & 27
- Describe the characteristics and operating procedures of the dose/dose rate instruments: DT-60, CP-95, AN/PDR 43, 27 & 65, pocket dosimeter IM-143, and AN/PDR 65
- State the functional description of the multi-function RADIAC set
- Describe the operational characteristics of the multi-function RADIAC set

Purpose

- Designed to
  - Detect or measure alpha, beta & gamma radiation
  - Measure intensity
  - Determine the extent of contamination
  - Provide information for calculating the stay time of personnel

Dosimeters

- Dosimeters
  - Device worn to record the accumulated dose of ionizing radiation received



DT-60/PD

- Non-self-reading mass issue dosimeter
- Measures gamma radiation
- Issued to all hands
- Has a range of 10R-600R
- Cannot be zeroed or calibrated

DT-60

CP-95/PD, CP-95A/PD Radiac Computer Indicators

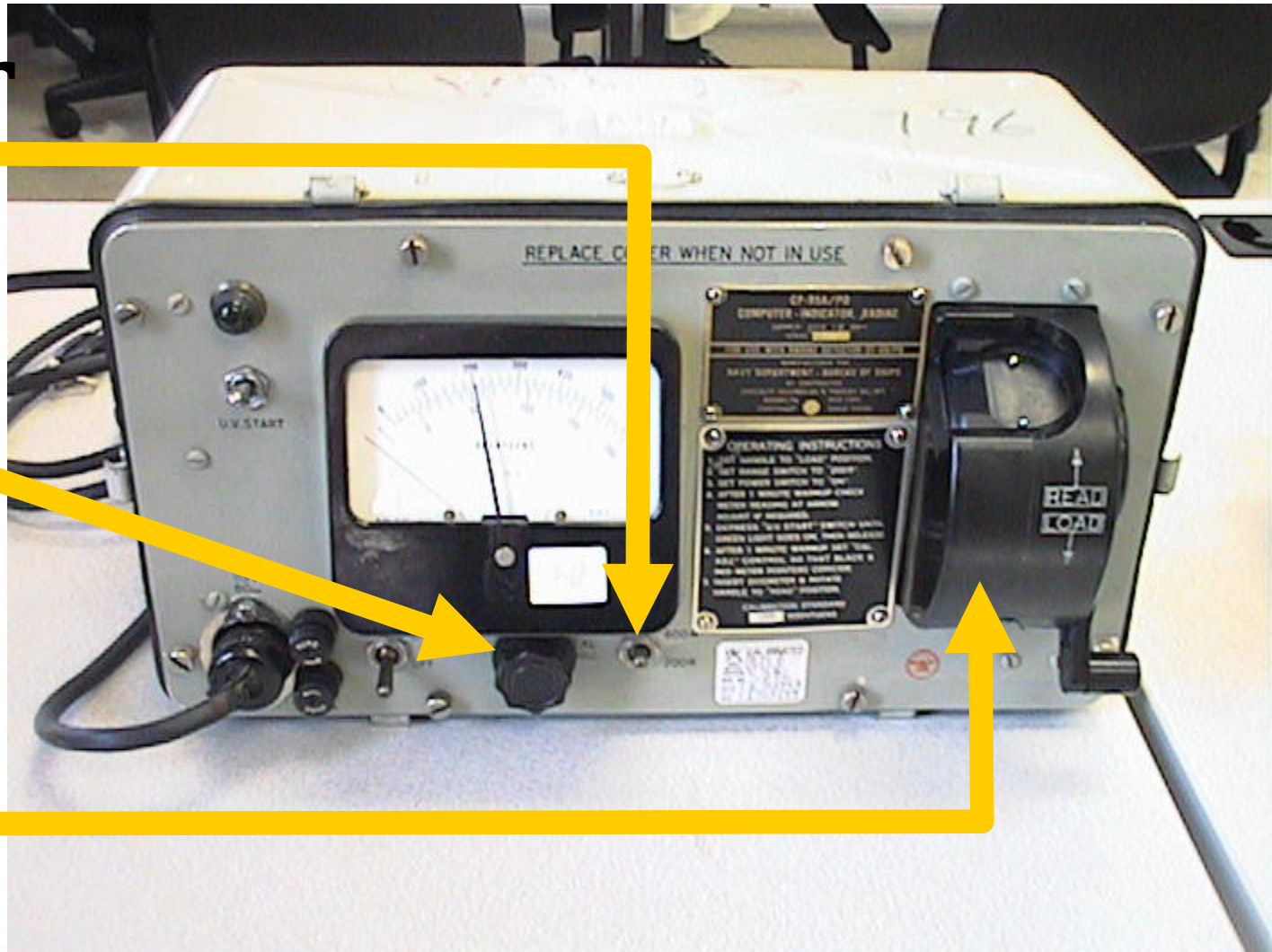
- Reads the DT-60
- Two range selections
  - 0 - 200
  - 0 - 600
- Power Supply 115-V ac. 60-HZ

CP-95

Selector switch

Cal. Adj. Knob

Loading drum



IM-143 pocket dosimeter

- Issued to key personnel
- 0-600R scale
- Self reading
- Can be calibrated
- Calibrated by the PP-4276

PP-4276

RECEPTACLE
DOWN
SCALE
PP-4276C/PD
RADIAC DETECTOR CHARGER
NAVAL ELECTRONIC SYSTEMS COMMAND
CONTRACTOR
CHATTERTON RESEARCH CORPORATION
CHATSWORTH, CA.

PP-4276

- Powered by 1 D Cell
- Operation
  - Insert IM-143 onto receptacle
  - Depress firmly while viewing the dosimeter scale through its eye piece
  - Rotate charging knob until quartz fiber image in IM-143 indicates zero
  - Remove IM-143

Dose
Rate
Instrume
nts

AN/PDR-43F

- Navy Standard High Range Beta/Gamma RADIAC instrument
- Functions
  - Topside radiation surveys
  - Detects & measures high gamma radiation intensities
  - Detects beta radiation, Does not measure beta radiation

Characteristics

- Range 0-500R/hr
- Powered by 2, D cell batteries
- Range selector switch
  - Off
  - Battery check
  - 500 R/hr
  - 50 R/hr
  - 5 R/hr

Characteristics

- Meter illumination switch
- Function selector knob, spring loaded
  - Beta
  - Gamma
  - Check

AN/PDR 43

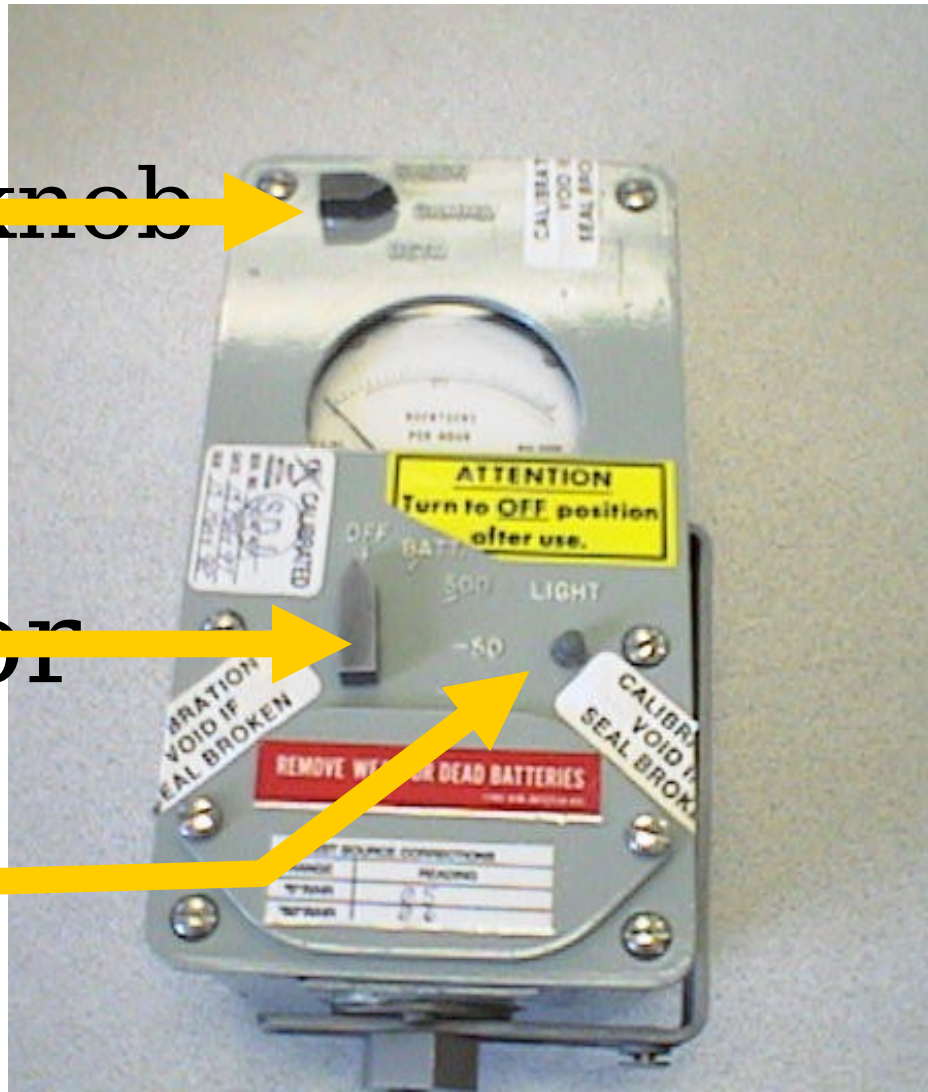
- Beta position measures gamma & detects beta on all scales
- Gamma position measures gamma only, on all scales
- Check position exposes the radioactive test source to probe for operational check

AN/PDR 43

Function selector knob

Range selector

Meter illumination switch

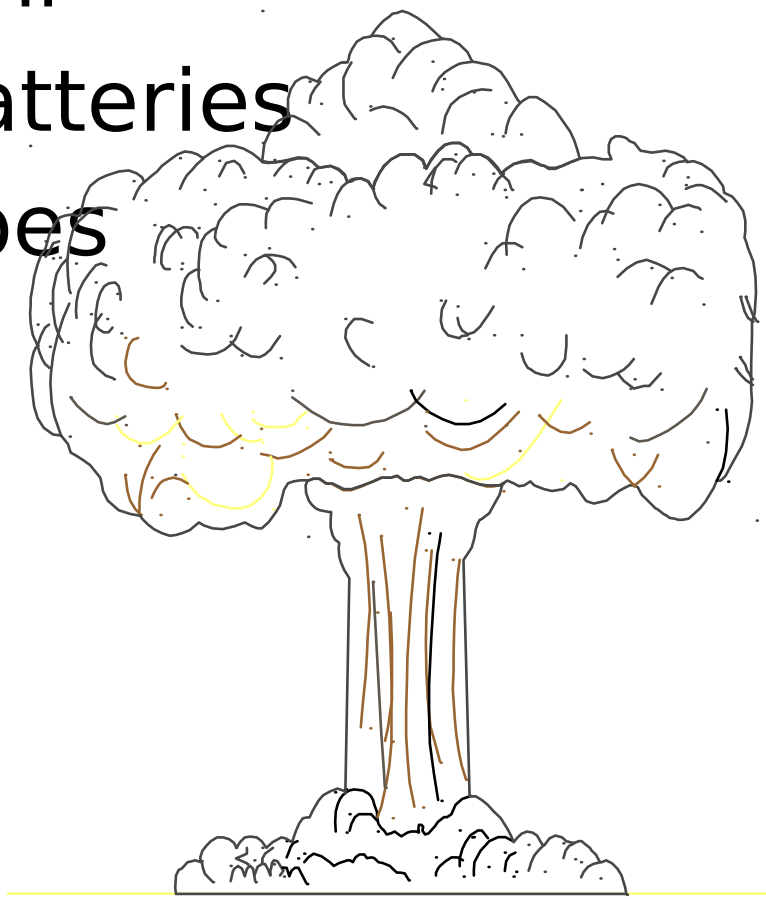


AN/PDR-27

- Navy Standard Low Range Beta/Gamma RADIAC instrument
- Function
  - Personnel monitoring & low intensity surveys
  - Detects low intensity beta radiation
  - Measures low intensity gamma radiation

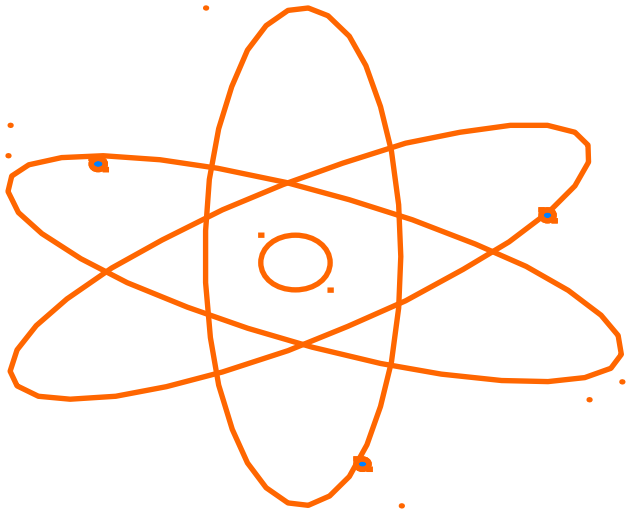
Characteristics

- Range of 0-500 MR/hr
- Powered by 2 "D" batteries
- 2 Geiger-Mueller tubes
- 4 ranges



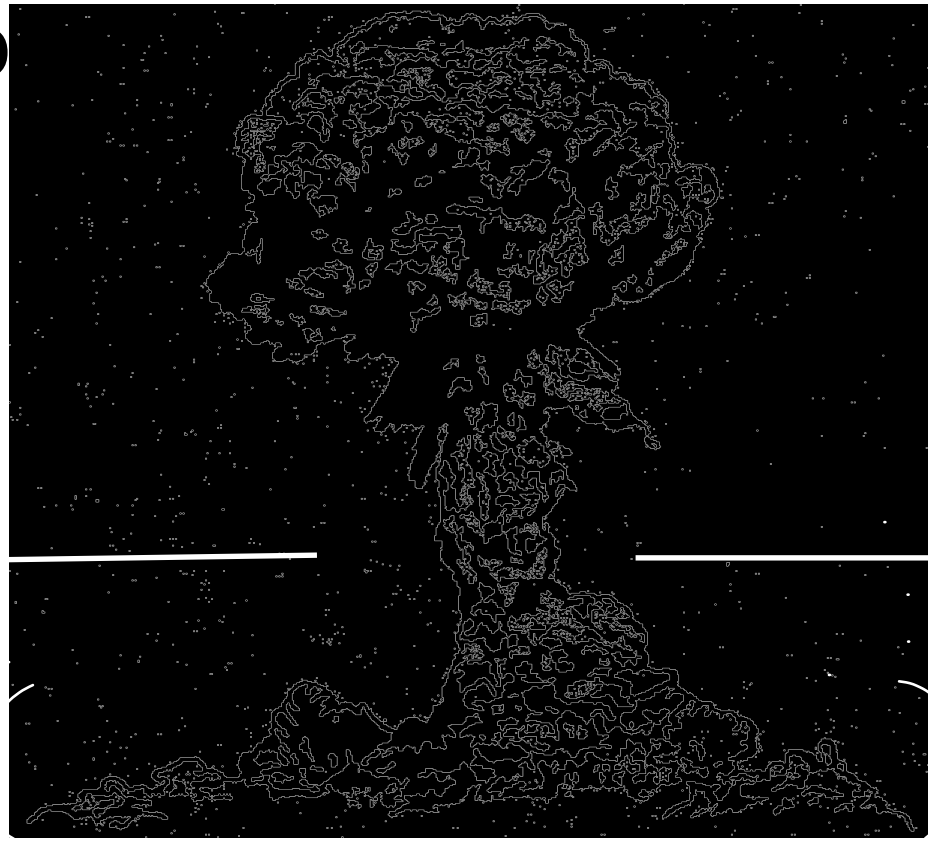
AN/PDR 27

- Range selector switch positions
  - Off
  - BATT
  - 500 MR/hr
  - 50 MR/hr
  - 5 MR/hr
  - .5 MR/hr



AN/PDR 27

- Meter illumination switch
- Headpho



AN/PDR 27 Probes

- Large:
  - Connected to the 2 lower scales
  - Detects beta & measure gamma radiation when beta shield is open
  - Measures gamma only when beta shield is closed
- Small
  - Connected to all 4 scales
  - Measures gamma radiation only

Range selector
PROBES
BETA SHEILD

AN/PDR-65

- Navy Standard Fixed/Mounted Radiac
- Functions
  - Provides gamma radiation dose & dose rate information

Characteristics

- Gamma intensity up to 10,000 R/hr
- Measures gamma dose to 9,999 R/hr
- 115 VAC or 4 NICAD batteries
- Consists of a detector assembly, power supply & remote control unit, remote detector mounting bracket, 200 feet of remote detector cable

AN/PDR-65 RADIAC SET 2
RADIAC METER
AN/PDR-65 RADIAC
POWER SUPPLY
POWER
ON
OFF
LOCAL
DETECTOR
REMOTE
CONTROL-POWER SUPPLY

Multi-function Radiac AN/PDQ-1 & 2

- Hand held electronic monitoring devices containing an internal gamma detector
- Interfaces with external measurement probes for alpha, beta, gamma/ beta, neutron and x-ray radiation
- Designed to replace the existing radiacs in use today

Component Characteristics and Functions

- AN/PDQ-1 & 2 are identical except for the line display
- Internal gamma detector (Geiger-Muller) GM tube
- Housing assembly with front panel controls (five button key pad)

AN/PDQ-1&2

- Power key
- Alarm set key
  - allows operator to temporarily alter the alarm set-points
- Audio key
- Light key

AN/PDQ-1 & 2

- Alarm ACK (acknowledge) key
  - When depressed and held for 5 seconds, the control unit will perform a reset where all Built In Tests (BIT) are performed
- Single line display AN/PDQ-1
- Dual line display AN/PDQ-2
- Liquid Crystal Display (LCD)

AN/PDQ-1 & 2

- Powered by two D-cell batteries
- 200 hours of battery life for the meter
- 100 hours when the meter & probe are used together
- Detection range is background to 1000 R/h

AN/PDQ-1 & 2

- Carrying Case
  - Waterproof
- Headset
- Shoulder strap
- Lightweight
- Operators manual

Ancillary probes used with the AN/PDQ-1 and 2

- Gamma/Beta (DT-680/PDQ)
- Single GM tube which covers an eight decade measurement range
- Beta sensitivity is provided through a side beta sliding window opposite the cleat mechanism
- Includes a separate carrying case

Beta probe DT-685 & DT-304/PDQ

- Single "pancake" probe holder, GM tube (DT-304/PDQ)
- Beta sensitivity is provided through an integral beta window
- Includes a separate carrying case

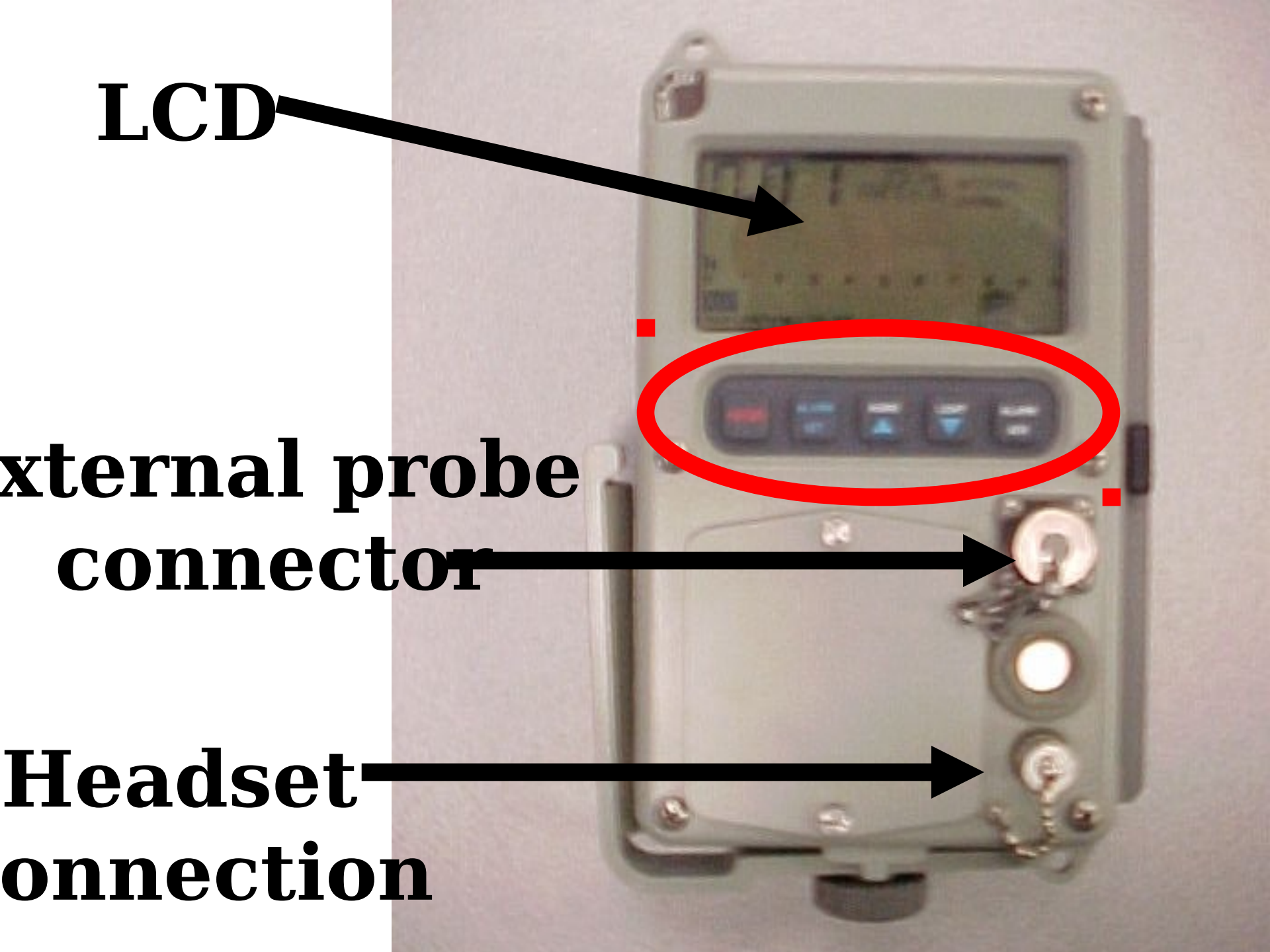
Additional Probes

- DT-680/PDQ - Gamma/ Beta probe
- DT-681/PDQ - Alpha probe
- DT-683/PDQ - Neutron Indicator Probe, Explosive Ordnance Disposal (EOD)

Additional Probes

- DT-684/PDQ - Neutron Probe
- DT-685/PDQ - Beta Probe with DT-304/PDQ "pancake" holder.
- DT-686/PDQ - Radiography Probe

DT-680/PDQ - Gamma/ Beta pro


LCD
xternal probe
connector
Headset
onnection

AN/PDQ-1 with external probe

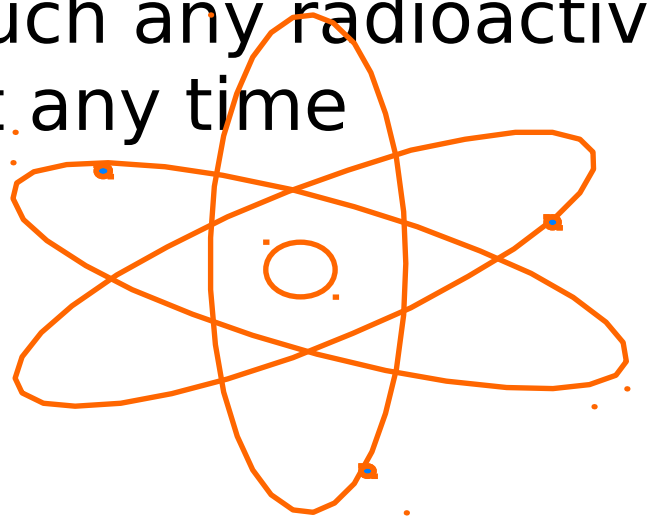
AN/PDQ-1 with
external probe

Laboratory Safety Procedures Associated with Radioactive Material

- DO’S
  - Personnel will wear a pocket dosimeter unless otherwise directed by the Radiation Safety Officer
  - Personnel will be monitored after handling radioactive material
  - Personnel will wash their hands after handling sources

Laboratory Safety Procedures Associated with Radioactive Material

- Don'ts
  - Do not smoke, eat, drink or chew at anytime when working with radioactive material
  - Do not touch any radioactive material directly at any time



Summary

- Dosimeters
- AN/PDR 43
- AN/PDR 27
- AN/PDR 65
- AN/PDQ-1 & 2
- Lab safety